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(71) Applicant (*for all designated States except US*): ENVENTURE GLOBAL TECHNOLOGY [US/US]; 16200 A. Park Row, Houston, TX 77084 (US).

(72) Inventors; and

(75) Inventors/Applicants (*for US only*): SHUSTER, Mark [US/US]; 19115 Prospect Ridge Lane, Houston, TX 77094 (US). COSTA, Scott [US/US]; 2011 Willow Point, Kingwood, TX 77330 (US).

(74) Agent: MATTINGLY, Todd; Haynes and Boone, LLP, Suite 3100, 901 Main Street, Dallas, TX 75202 (US).

(81) Designated States (*unless otherwise indicated, for every kind of national protection available*): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

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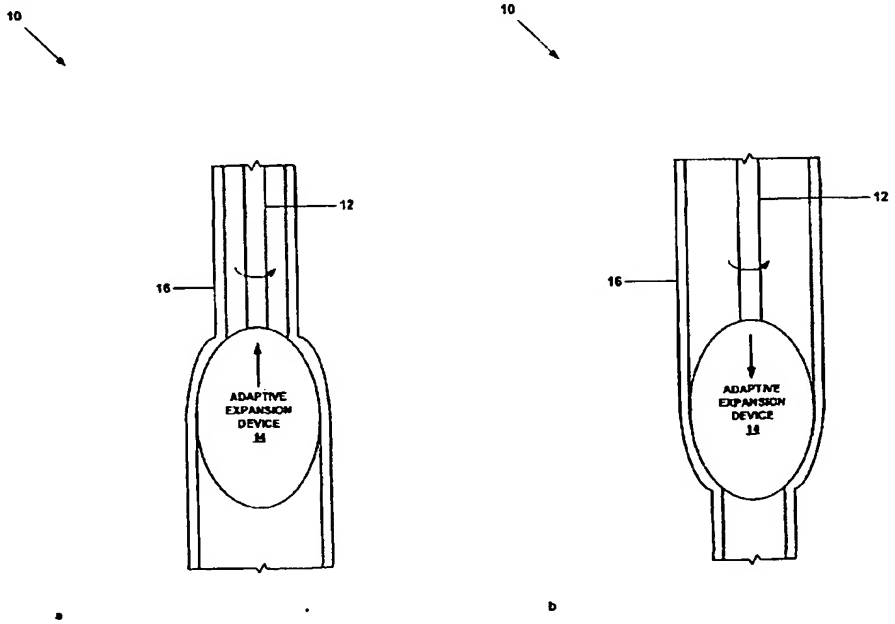
Declaration under Rule 4.17:
— *of inventorship (Rule 4.17(iv)) for US only*

[Continued on next page]

(54) Title: APPARATUS AND METHOD FOR RADIALLY EXPANDING A WELLBORE CASING USING AN ADAPTIVE EXPANSION SYSTEM



(57) Abstract: An apparatus and method for radially expanding a wellbore (34) using an adaptive expansion device (14).

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31 March 2005

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/US04/08030

A. CLASSIFICATION OF SUBJECT MATTER
IPC(7) : E21B 43/10, 23/00
US CL : 166/380, 207, 214, 250.01
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
U.S. : 166/380, 207, 214, 250.01

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
Please See Continuation Sheet

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
T	US 6,722,427 B2 (GANO et al) 20 April 2004 (20.04.2004), claims 10, 25, and 29.	13-18
T	US 2004/0065446 A1 (TRAN et al) 08 April 2004 (08.04.2004), paragraphs [0054] and [0057].	13-18
X, P	US 6,688,397 B2 (MCCLURKIN et al) 10 February 2004 (10.02.2004), column 6, lines 40-49.	13-18
A	US 5,253,713 A (GREGG et al) 19 October 1993 (19.10.1993), Figures 3 and 6-8, column 6, lines 57-66.	1-3
A	US 5,749,585 A (LEMBCKE) 12 May 1998 (12.05.1998), column 1, lines 45-55 and column 3, line 55 through column 4, line 8.	1-3
A	US 5,282,508 A (ELLINGSEN et al) 01 February 1994 (01.02.1994), column 19, lines 47-50 and claim 7.	4-6
A	US 6,012,521 A (ZUNKEL et al) 11 January 2000 (11.01.2000), column 13, lines 44-51.	4-6

☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

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"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

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Date of the actual completion of the international search
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Date of mailing of the international search report
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Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450
Facsimile No. (703) 305-3230

Authorized officer
David Bagnell
Telephone No. 703-308-1113

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INTERNATIONAL SEARCH REPORT

International application No.
PCT/US04/08030

Continuation of B. FIELDS SEARCHED Item 3:
EAST: expansion cone, expansion tool, expansion device, expansion member, adaptive, spring rate, damping rate, adjusting frequency, adjusting operating characteristic

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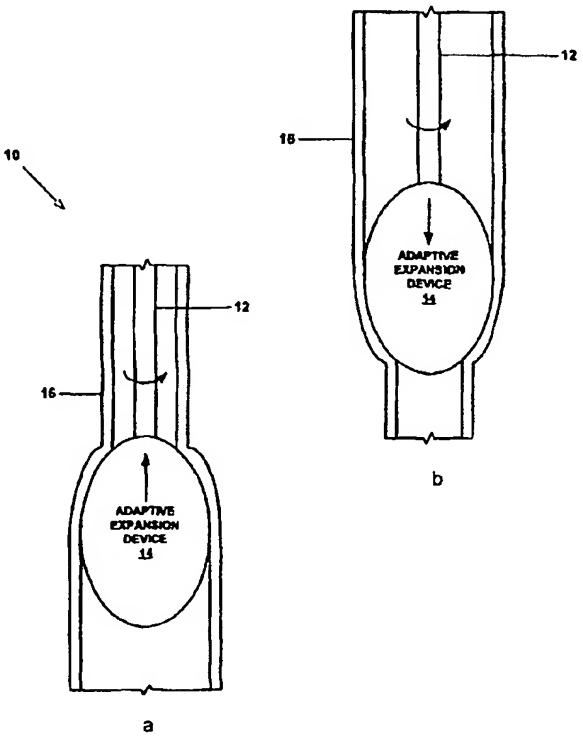

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AMENDED CLAIMS
[received by the International Bureau on 04 Mars (04.03.2005);
new claims 31-33 added; remaining claims unchanged (2 pages)]

24. The method of claims 2, 5, 8, 11, 14, or 17, wherein radially expanding and plastically deforming the tubular member using the adaptive expansion device comprises:

displacing the adaptive expansion device relative to the tubular member in the longitudinal direction.

25. The method of claims 2, 5, 8, 11, 14, or 17, wherein radially expanding and plastically deforming the tubular member using the adaptive expansion device comprises:

rotating the adaptive expansion device relative to the tubular member.

26. The method of claims 2, 5, 8, 11, 14, or 17, wherein radially expanding and plastically deforming the tubular member using the adaptive expansion device comprises:

applying a pressurized fluid to the interior surface of the tubular member.

27. The system of claims 3, 6, 9, 12, 15, or 18, wherein the means for radially expanding and plastically deforming the tubular member using the adaptive expansion device comprises:

means for displacing the adaptive expansion device.

28. The system of claim 27, wherein the means for displacing the adaptive expansion device comprises one or more degrees of freedom.

29. The system of claim 27, wherein the means for displacing the adaptive expansion device comprises a plurality of degrees of freedom.

30. The system of claims 3, 6, 9, 12, 15, or 18, wherein the means for radially expanding and plastically deforming the tubular member using the adaptive expansion device comprises:

means for radially expanding and plastically deforming the tubular member using a hydro-forming device.

31. The apparatus of claims 1, 4, 7, 10, 13, or 16, wherein one or more of the expansion device segments comprise:

one or more expansion surfaces; and

an actuator coupled to the expansion surfaces;

wherein the actuator comprises a plurality of degrees of freedom;

wherein the actuator comprises one or more rotary actuators; and

wherein one or more of the expansion device segments comprise:

one or more hydro-forming devices.

32. The method of claims 2, 5, 8, 11, 14, or 17, wherein radially expanding and plastically deforming the tubular member using the adaptive expansion device comprises:

displacing the adaptive expansion device relative to the tubular member in the longitudinal direction;

wherein radially expanding and plastically deforming the tubular member using the adaptive expansion device comprises:

rotating the adaptive expansion device relative to the tubular member; and

wherein radially expanding and plastically deforming the tubular member using the adaptive expansion device comprises:

applying a pressurized fluid to the interior surface of the tubular member.

33. The system of claims 3, 6, 9, 12, 15, or 18, wherein the means for radially expanding and plastically deforming the tubular member using the adaptive expansion device comprises:

means for displacing the adaptive expansion device;

wherein the means for displacing the adaptive expansion device comprises a plurality of degrees of freedom; and

wherein the means for radially expanding and plastically deforming the tubular member using the adaptive expansion device comprises:

means for radially expanding and plastically deforming the tubular member using a hydro-forming device.

AMENDED SHEET (ARTICLE 19)